

## NOTES ON AUSTRALIAN MARINE ALGÆ, i.

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(Plates i.-v.)

## FUCOIDEÆ.

## TURBINARIA Lamour.

*T. ornata* J. Ag.—Mr. C. Hedley collected several specimens of *Turbinaria* on Murray Island, Torres St., which agree with *T. ornata* except that the receptacles are all distinctly racemose and not at all cymose. The largest measured 20 cm. in length, the peltate laminæ were in general 17 mm. in diameter, including the teeth of the margin. A second crown of teeth was present on a few of the laminæ. The “leaves” were hollowed out into vesicles. Stolons were borne abundantly on the lower stipes, but I could not find any buds upon them. The species is widely distributed over the Pacific and Indian Oceans, and throughout the Malay Archipelago. On the Queensland coast it has been gathered as far south as Port Denison. Mr. Hedley’s form may be distinguished as forma *racemosa*.

Some years ago I picked up a fragment of a *Turbinaria*, probably of this species, which had been carried south with the pumice of the northern island volcanoes, and thrown up on the beach at Bronte, near Bondi.

The branching *Turbinarias* found on our north coasts are *T. conoides* Kuetz., and *T. decurrens* Bory. A third slender branching form, *T. gracilis* Sond., from West Australia, was figured by Harvey (Phyc. Austr., Pl. 131).

Of the simple forms, *T. trialata* Kuetz., recorded from W. Australia by Labillardière, was figured by Kuetzing (Tab. Phyc. x., t. 69). It is not listed as Australian by Sonder, who was, however, acquainted with it from San Domingo in the West Indies. *T. ornata* was already figured by Turner.

A. and E. S. Gepp have figured *T. murrayana* of the latter, from specimens collected in the Seychelles by J. Starkie Gardiner

during the "Sealark" Expedition to the Indian Ocean (Trans. Linn. Soc. Lond., Vol. xii., Pt.4, 1909). This form has been recorded from Macassar and from New Guinea, and may well be found in the future on the islands of Torres St. and perhaps on our tropical coasts. In *T. murrayana* there are no vesicles, the leaves being solid. May not the simple unbranched form with solid leaves be a reef-growing stage of *T. decurrens*? One is so familiar with non-development of vesicles until they are functionally needed in other Sargassaceæ, notably *Sargassum* and *Cystophora*, that one may expect to find evesiculose individuals in the case of normally vesiculose species of *Turbinaria*. In fact, there is a similar variety, *evesiculosa* Bart., of *T. conoides*. Both vesicled and unvesicled forms of this species grew in the Seychelles on reefs exposed at dead low tide, but in different localities.

#### CYSTOPHYLLUM J.Ag.

*C. muricatum* (Turn.) J.Ag., has a wide range, from the Tropics to Tasmania. It is recorded from the Sunda Islands and Australia (Freycinet, Preiss, Gaudichaud), and the Admiralty Islands (Dickie). Harvey says it is found throughout the Indian Ocean. It probably occurs all round the Australian coasts. Thus Harvey gives the range "from King George's Sound to Port Jackson, in various places." Victorian records are Port Phillip (F. v. Mueller), Geelong (Lucas), Port Phillip Heads and Western Port (J. B. Wilson). Sonder gives Georgetown, Tasmania. In New South Wales I have found it in Botany Bay and Port Stephens. Mr. D. Stead sent me specimens from Wallis Lake, where it is regarded as a nuisance on the oyster-banks; and Sonder gives Clarence River. Queensland localities are Moreton Bay (Lucas), Port Denison, Rockingham Bay, Cooktown, and Whitsunday Island (Sonder). This is a remarkably extended distribution for a brown alga whose habitat is sheltered harbours.

Figured, Turner (Hist. Fuc. ii., Pl.112), Harvey (Phyc. Austr., Pl.139). The fruiting receptacles are very similar to those of *Sargassum*, and are produced in the summer about Sydney.

De Toni includes *Sirophysalis binodis* Kuetz., (Tab. Phyc. x., t. 59, f. 2) as *C. muricatum* var. *binodis* (Kuetz.). The description is: "Fronds muricate; aculei rather lax, thickened at the apex, bi- or tri-dentate, divaricate; vesicles in pairs, rarely threes, lanceolate. Australia (Kuetzing)." I have not seen the type of this variety, but individuals of our species seem to answer well enough to this description.

*C. onustum* (Mert.) J. Ag., Holdfast Bay, W. A (F. v. Mueller), and Mus. Paris, and *C. australe* Sonder, Holdfast Bay (F. v. Mueller) are nearly allied forms to *C. muricatum*. De Toni does not list the latter, which is recognised by Harvey in his Syn. Cat. I have not seen either.

#### HORMOSIRA Endl.

*H. (?) articulata* (Forsk.) Zan.—I had the good fortune to discover this singular species, with its remarkable triquetrous stem with interrupted alternate wing-expansions, growing on a rocky shelf around a small island in the upper reaches of Port Stephens. It was growing in company with *Cystophyllum muricatum*, and could be gathered while wading at low tide.

To make sure of my identification of this species, which is known as a Red Sea species, possibly occurring also in the China Sea, I submitted a specimen to Mrs. E. S. Gepp, who kindly compared it with the specimens of *H. articulata* in the British Herbaria. She confirms the identification.

Judging from the distribution so far known, we may expect to find this plant further north. Like *C. muricatum*, it appears to affect the quieter waters of sheltered harbours.

#### NOTHEIA Bail. & Harv.

*N. anomala* Bail. & Harv.—This interesting parasite is only listed by De Toni from New Zealand and Tasmania. Harvey, however, recorded it from the south coast of Victoria at Port Fairy and Port Phillip Heads. I found it growing abundantly at Barwon Heads, and J. Bracebridge Wilson at Western Port. I have since traced it along the coast of New South Wales from Twofold Bay to Port Stephens. It is evidently, then, widely

distributed around the shores of the south-east Australasian seas. Personally I have only found it growing on the varieties of *Horomosira banksii*.

#### HALISERIS Targioni-Tazzetti.

Fronde laminar, membranaceous,\* dichotomous, midribbed, segments broadly linear, formed of two layers of cells, interior cells rather angular, those constituting the midrib non-approximated, cortical cells subcubical, monostromatic, densely packed with endochrome. Spores scattered on both surfaces of the frond. Tetraspores collected in naked sori, sublinear or in patches, evolved on both surfaces of the frond. Paranemata separate from the sporiferous sori, in small clumps, articulate, club-shaped. Antheridia clustered in sori.

None of the Australian species show marginal veins.

i., Fronds membranaceous, with no veins from the midrib.

*H. polypodioides*(Desfont.) Ag. A form of wide distribution, Europe, Atlantic, S. Africa, Red Sea, Persian Gulf, Japan.—“Tasmania(Harvey)” De Toni.

*H. woodwardia*(R.Br.) J.Ag. = *H. polypodioides* var. *denticulata* Sonder. — Has the habit of *H. polypodioides*, but the margins of the fronds are beset with numerous denticles.

Cape York(Daemel), Rockingham Bay(Dallachi), Ballina(Henderson).—Sarawak(Zanardini), China Sea(Kuetz). — Figured by Kuetzing(Tab. Phyc. ix., t.53).

*H. muelleri* Sonder, Linnæa(Vol.25; Fig., Harvey, Phyc. Austr., Pl.180).—Sori of tetraspores in oblong cloud-like patches, confluent over the greater part of the frond from the midrib to the margins. Axils rounded, margins entire. Fronds to 50 mm. wide. Proximal part of frond gradually denuded. Tufts of paranemata scattered equally over the whole frond, alternately on one face and on the other.

West and south coasts of Australia (Sonder, Harvey), Anglesea, Barwon Heads, Port Phillip(Lucas), Port Phillip Heads and Western Port(J. Br. Wilson), Cape Schank(Mrs. Barker).—Tasmania(W. H. Archer).

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\* Coriaceous in the Brazilian *H. areschougii* J. Ag.

Both Harvey and Sonder included the following under *H. muelleri*.

*H. acrostichooides* J. Ag., Till. Algernes System, v.—Sori of tetraspores on each side of midrib in an elongated linear patch, recalling arrangement of sori in *Blechnum*, leaving wide sterile margins. Axils rather acute, margins entire. Fronds to 12 mm. in width, lanceolate. Proximal part of frond terete. Tufts of paranemata larger than in *H. muelleri*, and more conspicuously arranged in arcuate, subparallel rows, curving back from the midrib to the margins, those of alternate lines on opposite faces of the frond, not as De Toni writes, “per laminam sine evidenti ordine sparsa.” Radix a stupose mass, reaching up to several ounces in weight.

Tasmania (R. Gunn), Port Fairy (Harvey), Port Phillip Hds., and Western Port (J. Br. Wilson), Port Jackson and Port Stephens (Lucas), Moreton Bay (G. Gross).

Probably Sonder's record of *H. muelleri* for Cooktown properly belongs to this species.

*H. pardalis* Harv., Trans. Roy. Irish Acad., xx. Fig., Harvey, Phyc. Austr., Pl. 29.—Sori of tetraspores forming deflexed lines proceeding from the midrib to the margins. Tetraspores oval, with wide colourless perispores. Axils widely angular, segments very patent, margins entire, segments to 15 mm. (Harvey's fig.), proximal portion of stem becoming more or less denuded of lamina. Paranemata not seen.

“Cast ashore from deep water,” Fremantle, W.A. (Harvey, Clifton).

*H. crassinervia* Zanard.; Phyc. Austr. nov. sub n. 5.—Sori not seen. Axils rather acute, segments distant, widely linear, obtuse, margins entire. Paranemata not seen. Stout conspicuous midrib blackening on drying; rest of frond firm, turning dark brown on drying.

Lord Howe I. (Fullagar, Lind). Needs elucidation.

ii., Fronds membranaceous, with veins running from midrib to margins.

*H. australis* Sond., Alg. Mueller., Linnæa xxv. Fig., Kuetz., Tab. Phyc. ix., t. 54.—Sori not seen. Axils rather acute, margins

entire, segments broad linear, obtuse, to 25 mm. wide. Numerous very fine veins running out from the midrib obliquely toward the margins, easily detected by the naked eye. Paranemata not seen.

Lefebvre Peninsula(Sonder), "Port Denison &c. Australiæ" (Kilner, F. v. Mueller). Needs elucidation.

*H. plagiogramma* Mont., Cent. i. Fig., Kuetz., Tab. Phyc. ix., t.57.—Sori forming a subcontinuous spot along each side of the midrib. Axils rather acute, margins entire. Numerous fine veins running out from the midrib obliquely to the margins, about 1 mm. apart. Paranemata not recorded. Frond small, scarcely 12-14 cm. long.

Atlantic, Sandwich Islands.—Australia(Zanardini).

#### SPERMATOCHEMUS Kuetz.

(Plate i.)

*S. lejolisii*(Thur.) De Toni.—This graceful and delicate alga was a sore puzzle, as it seems to be without fruit, and no fucoid of our Australian list seemed to even approach it. I accordingly forwarded a specimen to Mrs. E. S. Gepp of the British Museum, who has most kindly helped me out of other difficulties. She wrote "A new record for Australia! Dr. Kuckuck, the authority on this group, is now working here, and he named it, so there is no doubt about it. He is making a new genus on *S. lejolisii*, and has studied the European specimens of it."

Shores of France(Le Jolis) and England(Holmes). I found it growing on fronds of a *Dictyota*, on a shelf of rock made accessible at low water, on an island in the inner harbour of Port Stephens.

#### MYRIOCLADIA J. Ag.

*M. sciurus* Harv.—Mr. L. Rodway sent me this alga, gathered by him at Retreat, on the Derwent River, Tasmania. It had previously only been found in Victoria (Port Fairy), and New South Wales (Newcastle). Harvey did not secure fruiting specimens. The Tasmanian specimens were in full fruit, the sporangia being characteristic of the genus as defined by J. Agardh.

*Ulva lactuca* L.—Our common *Ulva*, which I take to be *U. lactuca*, is, when only 2 mm. wide, a flat or gently waved membrane. I have never seen any appearance of a tube or horn. Very old individuals develop, in the basal part of the frond, an anterior layer which gives to it a much greater thickness and solidity. I append drawings of sections of this basal dark green portion, which, if seen alone and reaching some inches in dimensions, has the appearance of a totally different plant(Plate v.).

The following seem to be new species.

NITOPHYLLUM SINUOSUM, sp.n.

(Plates ii.-iii.)

Fronde breviter stipata, tenue membranacea, avenia, circumscriptione ovali, densissime circumcirca lobata et undulata; stipite cuneato ad 6 vel 7 mm. longo, mox evanescente; margine integerrimo in breves sublineares lobos egrediente, apicibus loborum obtusis fere rectilinearibus; cystocarpis rotundatis 1 mm. diametro metientibus, numerosis in media regione frondis, angusta pallidiori zona concentrice cinctis; soris oblongis, axi majore in marginem frondis verso, 2 mm. longo, per totam superficiem frondis superioris, zona satis lata prope marginem excepta, sparsis. Magnitudo frondis maxime variabilis, usque ad 35 cm. x 20 cm. Laciniae rarius visæ. Color pulchre roseus.

A handsome species belonging to the same Group as the Atlantic *N. punctatum*(Stackh.) Grev., and *N. crispatum*(Kuetz.) J.Ag., which appears to be its representative on both sides of Bass Straits. It differs from both in the general outline, being broad rather than long, and the lobes being short and square-edged. It is of a rich carmine when fullest coloured. This colour changes to orange after a few hours' standing in seawater, but returns on drying. The substance is thin and membranaceous, and the fronds adhere most closely to paper.

I have found it only in Botany Bay, where it grows in a few fathoms on the leaves of *Zostera* and *Cymodocea*. It may be obtained in fruit of both kinds, on different individuals, in any

month of the year. The oblong sori of tetrasporangia radiate outwards towards the edge of the frond.

*POLYSIPHONIA COMPACTA*, sp.n.

Cæspite densissimo, pulvinato; filis tenuibus, omnino articulatis et ecorticatis; primariis decumbentibus vel repentibus implicatis, largiter radicanibus; secundariis adscendentibus a basi erectiusculis, parcius dichotomis vage ramulosis; ramulis sparsis angustis axillis erectiusculis: articulis plerumque 9-siphoniis, filorum primariorum diametro sesquolongioribus, secundariorum aequalibus, ramulorum ultimorum gradatim brevioribus; apicibus simplicibus vel saepe furcatis fibrillis coronatis: tetrasporangiis in medio ramulo immersis seriatis, apparenter e singulo siphone transformatis: cystocarpiis nondum visis. Colore obscure rubro-vel brunneo-purpureo; substantia mollissima.

Grows in cushion or moss-like patches which cover and follow the inequalities of the rock. Variable in outline, irregularly oval; the patches may attain a longest diameter of 80 mm. or more, and may become confluent. The lower layer forms a firm imbricate reticulum; the upper, rising to a height of 10-15 mm., consists of free ramuli, very soft to the touch.

The primary filaments, somewhat stouter than the secondary, creep over the rock-surface, and are attached to it by numerous simple or forked colourless rhizoids. These do not arise from every joint, but as many as five may spring from one articulus. Each rhizoid, or division of a rhizoid, terminates in an expanded adhesive disc. The rhizoids were generally about twice as long as the joint to which they were attached, and their diameter was about  $\frac{1}{4}$  or  $\frac{1}{3}$  of that of the joint.

The tetrasporangia not moniliform, but extending in a series of — to nine or more in the middle of the ramulus. Fertile ramulus not infrequently branched, sometimes bearing an immature fertile ramellus. No cystocarps or antheridia as yet observed.

A narrow colourless zone, at each articulation, separated the siphons of adjacent joints. Siphons nearly constantly nine.

*Hab* — Rock-pools left by falling tide; Farm Cove, Port Jackson. Associated with *Ceramium clavatum*.



*New records for New South Wales.*

*Choudria curdiana* Harv., MS.—I have gathered this at Wollongong, Botany Bay, and Port Stephens. Herr J. Kretschman recently forwarded handsome specimens to the National Herbarium from Port Hacking. Some of these attained to a length of 24 cm., with an equal spread of branches. The species is of a beautiful iridescent blue while growing in the water, in this particular resembling its near ally, *C. carulescens*(Crouan) Falk., of the Atlantic and Mediterranean. It was sent to Harvey from Victoria.

*Bryopsis baculifera* J.Ag.—Miss M. Floekton found this elegant *Bryopsis* growing in a hemispherical mass on the muddy bottom of the Parramatta River at Ryde. The bright green filaments are so dense that the mass appears almost black in the water. Radius of mass about  $2\frac{1}{2}$  inches. The branching is most characteristic, the ramuli coming off in general alternately, at rather long intervals, except at the tips of the branches, constricted at the base, very obtuse and very long. It was found by J. Bracebridge Wilson in Port Phillip, probably on the flats about Mud Island.

We take the opportunity of reproducing photographically (Plate iv.) a well-grown specimen of *Sonderia bennettiana*(Harv.) F.v.M. The specimen was among the Algæ left by Mr. Charles Moore in the offices of the Botanical Gardens. There is no record of it, but it was probably dredged in Port Jackson by Dr. E. P. Ramsay. I have never obtained it either cast up or by dredging.

*New records for Tasmania.*

Mr. L. Rodway, Government Botanist, in May, 1912, forwarded to me, for identification, a very fine collection, made by him, of Tasmanian Algæ. I have so far identified 173 species. The collection contains a number of forms of great interest. Mr. Rodway's specimens are from the Derwent and Huon Rivers, the D'Entrecasteaux Channel, Southport, and Eaglehawk Neck, and a few from other localities. The Channel especially furnishes rarer species.

The following, so far as I know, have not been hitherto recorded from Tasmania.

## FUCOIDÆ.

- Sargassum linearifolium*(Turn.) Ag. Ralph's Bay.  
*S. paradoxum*(R.Br.) Harv. Derwent, Channel.  
*Cystophora siliquosa* J.Ag. Derwent.  
*C. torulosa*(R.Br.) J.Ag. Devenport, Derwent, Southport.  
*Gymnosorus variegatus* J.Ag. Channel.  
*Cutleria multifida*(Sm.) Gmel.  
*Myriocladia sciurus* Harv. Derwent.  
*Elachista australis* J.Ag. Derwent.  
*Colpomenia sinuosa*(Roth.) Derb. & Solan. Derwent.  
*Asperococcus compressus* Griff. Derwent, Eaglehawk Neck.  
*Cladostephus verticillatus*(Lightf.) Ag. Southport.

## FLORIDEÆ.

- Bangia atropurpurea*(Roth.) Ag. Derwent, Blackman's Bay.  
 var. *roseo-purpurea* Kuetz. Derwent.  
*Chantransia* sp. Huon.  
*Pterocladia lucida*(R.Br.) J.Ag.  
*P. capillacea*(Gmel.) Born. & Thur. Thouin Bay.  
*Erythroclonium muelleri* Sond. Near Actæon I.; dredged in  
 20 fathoms.  
*Rhabdonia robusta*(Grev.) J.Ag. Ralph's Bay.  
*Hypoglossum heterocystideum* J.Ag. Channel.  
*Phitymorpha imbricata* J.Ag. Derwent.  
*Laurencia botryoides*(Turn.) Gaill. Derwent.  
*Chondria succulenta*(J.Ag.) Falk. Channel.  
*Polysiphonia cæspitula* Sond. Eaglehawk Neck.  
*Ceramium clavulatum* Ag. Eaglehawk Neck.  
*Grateloupia filicina* Ag., var. *luxurians* A. & E. S. Gepp.  
 Derwent.  
*Amphiroa*(*Metagoniolithon*) *granifera* Harv. Devonport.

## CHLOROPHYCEÆ.

- Enteromorpha prolifera*(Muell.) J.Ag. Derwent.

*Chaetophora elegans*(Roth.) Ag. In fresh-water stream, Proctor's Road.

*Chaetomorpha aërea*(Dillw.) Kuetz. Derwent, Thouin Bay.

*Cladophora pellucida*(Huds.) Kuetz. Derwent.

*C. flaccida* Kuetz. Derwent.

*C. confervoides*(Roth.) Le Jolis. Channel.

*Rhizoclonium tortuosum* Kuetz. Derwent.

*Bryopsis hypnoides* Lamour. Eaglehawk Neck.

*Caulerpa cactoides*(Turn.) Ag. Near Actæon I., in 20 fathoms.

*Codium bursa*(L.) Ag.

*C. galeatum* J. Ag. Derwent.

Probably many other Victorian seaweeds will also be found on the other side of Bass Straits.

Good fruiting examples. of *Polysiphonia macrarthra* Zan., were sent. Cystocarps numerous, lateral on median branches, sphaerico-urceolate, on short stout pedicels consisting of one zone(articulus) of siphons. Cystocarps 2-3 times as long as pedicel, with a diameter shorter than that of the ramulus to which they are attached.

The following species of *Ptilonia* appears to be new.

*PTILONIA INTERMEDIA*, sp.nov.

Fronde lineari ex ancipite plana, ad 30 cm. longa, decomposito-pinnata. Caule initio fere tereti a basi scutata mox ancipite plano; ramis in ambitu ovalibus alternis axillis rotundatis bis vel ter pinnatis, rachide ad 2 mm. lata; pinnulis planis, linearibus, membranaceis, pinnellis paucis quasi dentiformibus e margine excurrentibus. Fronde stratis tribus contexta, costa filis articulatis ramosis longitudinalibus, centrale distinctum cingentibus, cellis intermedii rotundato-angulatis majoribus, cellulis corticalibus parvulis radiatis. Cystocarpiis sphaericis parvulis, 300 $\mu$ . diametro, muticis, apparenter terminalibus ex apice pinnellae praelongo evolutis. Color roseo-purpurea

D'Entrecasteaux Channel, Tasmania; November, 1910 (L. Rodway).

With the typical structure of frond and cystocarps of the genus, this graceful species, with the general habit of *Delisea*,

appears to be intermediate between *P. australisica* Harv., and *P. subulifera* J.Ag.

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EXPLANATION OF PLATES I.-V.

Plate i.

*Spermatococcus lejolisii*(Thur.) De Toni. (Half nat. size).

Plate ii.

*Nitophyllum sinuosum*, sp.nov. Tetrasporangiferous plant.

Plate iii.

*Nitophyllum sinuosum*, sp.nov. Cystocarpiferous plant.

Plate iv.

*Sondera bennettiana*(Harv.) F.v.M.[Syn. *Claudea bennettiana* Harv.].

Plate v.

Fig.1.—*Ulva lactuca* L., transverse section of basal portion.

Fig.2.—*Ulva lactuca* L.; longitudinal section of same.

Figs.3-4.—*Bryopsis baculifera* J.Ag.; tips of branchlets.

(Figs.1-2 from drawings by Miss M. Flockton.)